

Patent claims

1. A crossflow-filtration method for beverages, in particular beer, which are fed as the feed liquid at filtration intervals to a filter module with at least one membrane, which is cleaned with a cleaning solution and flushed with water from the filtrate side at cleaning intervals lying between the filtration intervals, characterized in that the following steps are carried out:

- a) introduction of the feed liquid (8) into the filter module (2) via a first connection (10) on the unfiltrate side (7) over a predeterminable flowing-over time period with an entry pressure which is adequate to keep the filtrate flow on the filtrate side (19) of the filter module (2) within predetermined limit values, and evacuation of the concentrate via a second connection (13) on the unfiltrate side (7) of the filter module (2),
- b) reduction of the entry pressure at the first connection (10) and backflushing by surges of filtrate by means of reversal of the direction of flow transversely to the membrane (6),
- c) repetition of steps a) and b) until the filtrate flow goes below the lower predetermined limit value,
- d) emptying of the filter module (2) by applying pressure,

- e) backflushing of the filter module (2) from the filtrate side (19) with water and subsequently with a solution containing chemicals,
- f) leaving the filter module (2) filled with the solution containing chemicals to rest for a predetermined exposure time,
- g) flushing of the filter module (2) with water until neutrality is established,
- h) filling of the filter module (2) with degassed water,
- i) forcing out of the water from the filter module (2) with filtrate and
- j) continuation with steps a) to i).

2. The method as claimed in claim 1, characterized in that step b) is followed by including the following steps:

- b1) introduction of the feed liquid (8) with reversal of the direction of flow longitudinally to the membrane (6) into the filter module (2) via the second connection or an adjacent third connection (13, 15) on the unfiltrate side (7) over the predetermined flowing-over time period with an entry pressure which is adequate to keep the filtrate flow on the filtrate side (19) of the filter module (2) within the predetermined limit values, and evacuation of the concentrate via the first connection or a fourth

- connection (18) adjacent the first connection (10) on the unfiltrate side (7) of the filter module (2), and
- b2) reduction of the entry pressure at the second or fourth connection (13, 18) and backflushing by surges of filtrate by means of reversal of the direction of flow transversely to the membrane (6).
3. The method as claimed in claim 2, characterized in that in steps a) and b1) the filtrate flow is kept substantially constant by means of regulating the speed of a recirculation pump (4).
4. The method as claimed in claim 2 or 3, characterized in that steps a) and b1) are respectively carried out in a fixed time interval of between one and five minutes.
5. The method as claimed in one of claims 2 to 4, characterized in that steps b) and b2) are carried out with a backflushing pressure which lies at least 0.5 bar above the entry pressure of the filter module (2).
6. The method as claimed in claim 5, characterized in that the backflushing pressure is generated by means of a filtrate backflushing pump (5) with a backflushing valve (23) arranged upstream toward the filter module (2) for generating a pressure surge.

7. The method as claimed in claim 6, characterized in that the opening time of the backflushing valve (23) is between 100 and 700 ms.

8. The method as claimed in claim 7, characterized in that the opening time of the backflushing valve (23) is about 300 ms.

9. The method as claimed in one of claims 3 to 8, characterized in that the output of the recirculation pump (4) is reduced to a new offset value (offset_n) directly after the backflushing.

10. The method as claimed in claim 9, characterized in that the output of the recirculation pump (4) is lowered to the new offset value (offset_n) already during the reversal of the direction of flow of the feed liquid (8) longitudinally to the membrane (6).

11. The method as claimed in claim 9 or 10, characterized in that the new offset value (offset_n) is calculated in accordance with the formula

$$\text{offset}_n = (\text{current output} - 15\% \text{ offset}_{n-1}) 0.9 + \text{offset}_{n-1}.$$

12. The method as claimed in one of claims 1 to 11, characterized in that the emptying of the filter module (2) of concentrate by applying pressure after step d) takes place with CO₂ as the gas.

13. The method as claimed in claim 12, characterized in that the concentrate is collected in a tank for later reuse.

14. The method as claimed in one of claims 1 to 13, characterized in that the backflushing after step e) takes place firstly with cold water and subsequently with hot water, to which sodium hydroxide solution is added shortly before shutting off.

15. The method as claimed in claim 14, characterized in that the filter module (2) is flushed with cold water for about 30 s and with hot water at a temperature of about 60°C for about 1 min.

16. The method as claimed in claim 14 or 15, characterized in that the metering of the sodium hydroxide solution is set such that the filter module (2) is filled with about 1% sodium hydroxide solution.

17. The method as claimed in one of claims 1 to 16, characterized in that the exposure time after step f) is at least 5 min.

18. The method as claimed in one of claims 1 to 17, characterized in that, in a way corresponding to step g), flushing is performed firstly with hot water for about 2 min and subsequently with cold water for about 4 min.

19. The method as claimed in claim 18, characterized in that citric acid is metered in with the cold water to establish neutralization.

20. The method as claimed in one of claims 1 to 19, characterized in that the membrane (6) has a pore size of 0.4 to 0.6 μm , preferably of about 0.5 μm .